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## Impurities Reduction Conditioning to Recover Best Beam Quality of J-PARC Cesium RF-Driven $H^-$ Ion Source with New Parts Exposed to Plasma

For the stable J-PARC operation, it is important for the J-PARC Cesium RF-Driven  $H^-$  Ion Source to produce the stable beam with the same superior quality, such as the small transverse emittances. Only three plasma chambers so called #7, #8 and #9 among 11 chambers are being used for the J-PARC operation, since their beam qualities are more superior than those of others. However, the transverse emittances of #7 were significantly degraded by the replacement of the plasma electrode temperature control plate (PETCP) due to the vacuum leak at the vacuum joint of the cooling of heating air tube brazed on the plate. The optimized pre-conditioning procedure to recover the superior transverse emittances demonstrated by using #4 plasma chamber with a replaced PETCP is presented.

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